

(12) UK Patent Application (19) GB (11) 2 351 274 (13) A

(43) Date of A Publication 27.12.2000

(21) Application No 0011756.4

(22) Date of Filing 17.05.2000

(30) Priority Data

(31) 9314728

(32) 18.05.1999

(33) US

(71) Applicant(s)

Caterpillar Inc

(Incorporated in USA - Illinois)

100 NE Adams Street, Peoria, ILLINOIS, IL 61629-6490,

United States of America

(72) Inventor(s)

Ken D Ahlers

Robert Q Elliott

John E Francis

Gerald L Graf

Kenneth J McGuire

Terry A Moore

(74) Agent and/or Address for Service

Murgitroyd & Company

373 Scotland Street, GLASGOW, G5 8QA,

United Kingdom

(51) INT CL⁷

E02F 9/08

(52) UK CL (Edition R)

B8H HFC H430 H551

(56) Documents Cited

EP 0741209 A2

EP 0285281 A1

US 4515520 A

(58) Field of Search

UK CL (Edition R) B8H HAC HFC

INT CL⁷ E02F 9/08

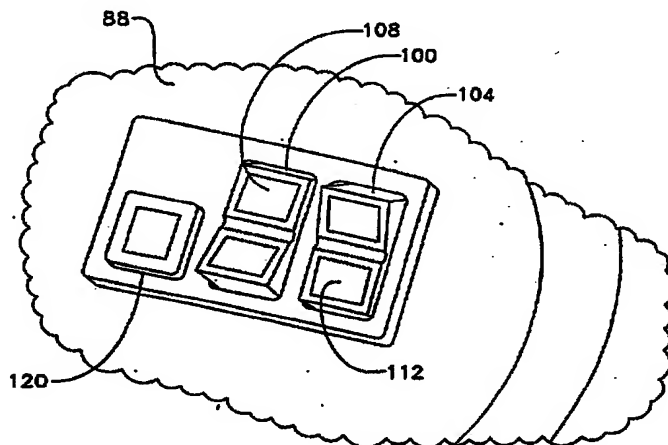
ONLINE : WPI, EPODOC, JAPIO

(54) Abstract Title

Auto-up switch for stabiliser legs

(57) Automatic and simultaneous retraction of a pair of stabilizer legs (24,28, Fig 1) for a backhoe loader machine (10) is beneficial for the operator when operation of the backhoe loader (10) is complete. Instead of retracting the stabilizer legs (24,28) by manually holding a pair of control switches (100, 104) continuously in a control position, the operator may simply push an auto-up switch (120) with a single, "one-touch" contact. Once the auto-up switch (120) has been activated, a timer relay (310, Fig 5) is enabled. The timer relay acts independently of the auto-up switch (120) to control the simultaneous retraction of the stabilizer legs without any further contact to the auto-up switch. When the timer relay (310) is enabled, it sends a signal to activate the control switches for a preselected time. The activation of the control switches actuates a pair of solenoid valves (190,194, Fig 4) which control the movement of the stabilizer legs (24,28) from any one of a plurality of extended positions to a fully retracted position within the preselected time.

Fig. 3



GB 2 351 274 A

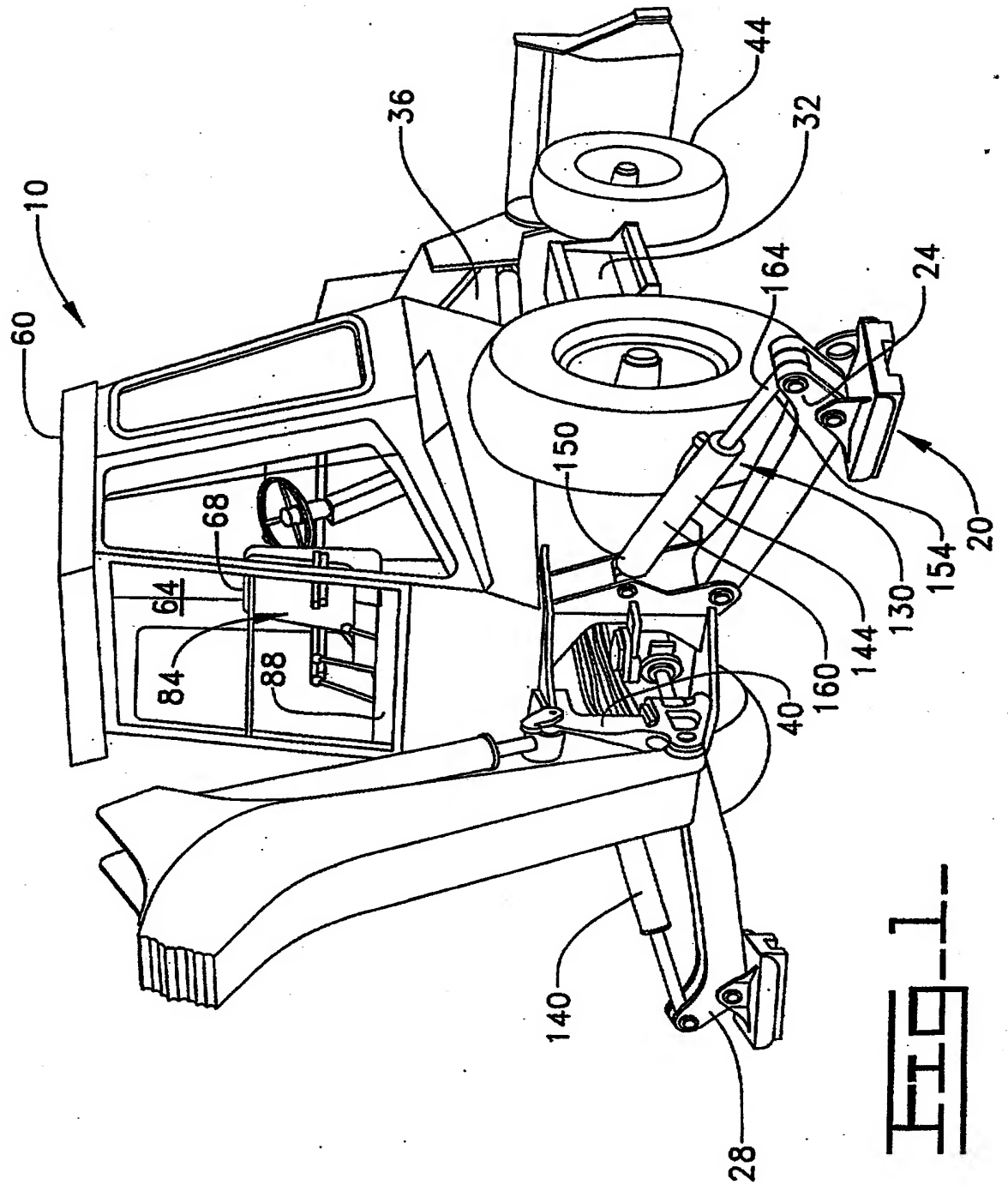


FIG. 1

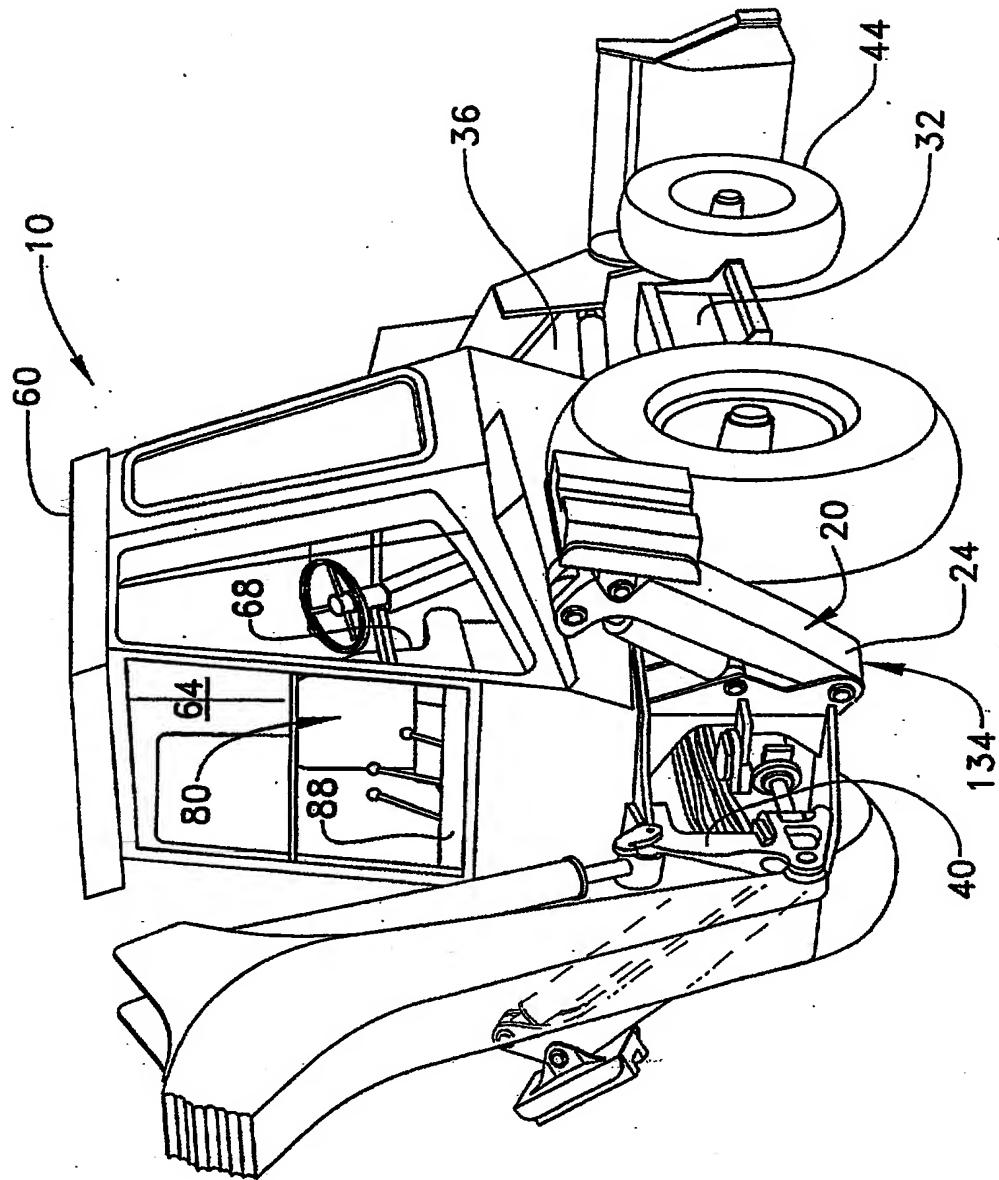
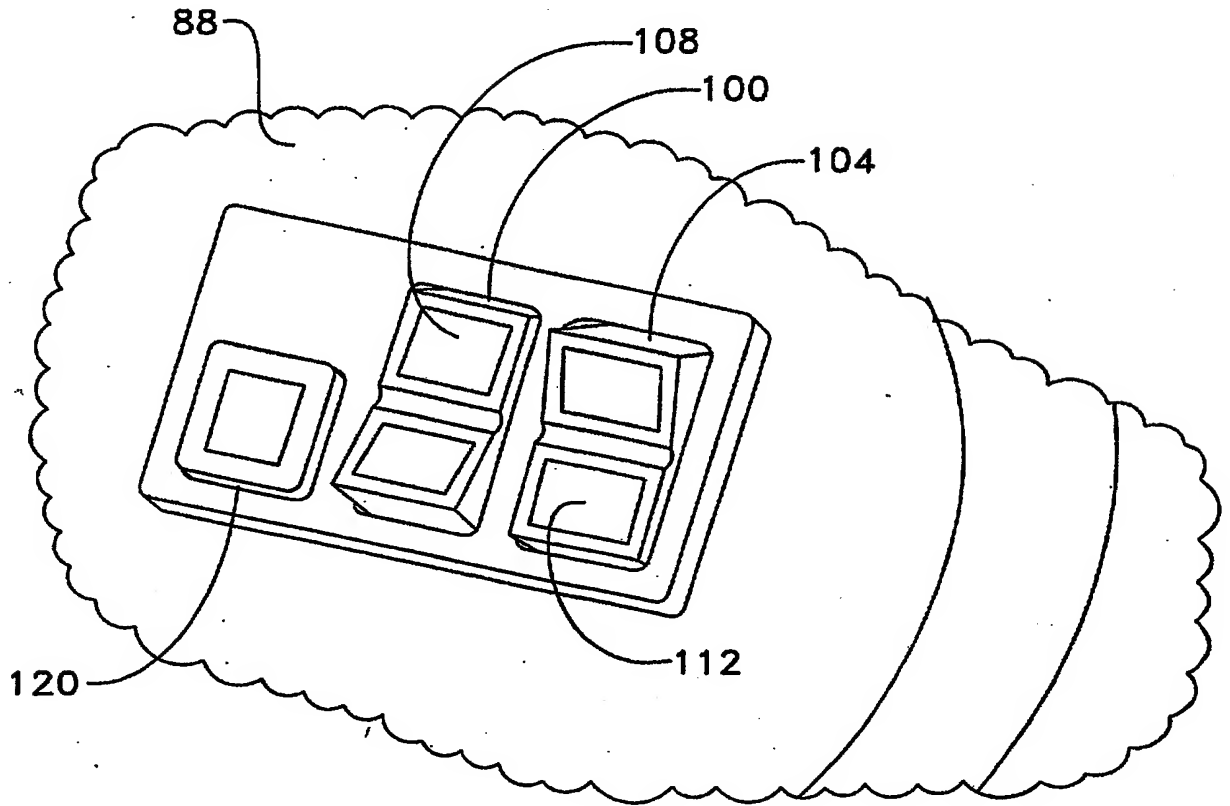


Fig-3-



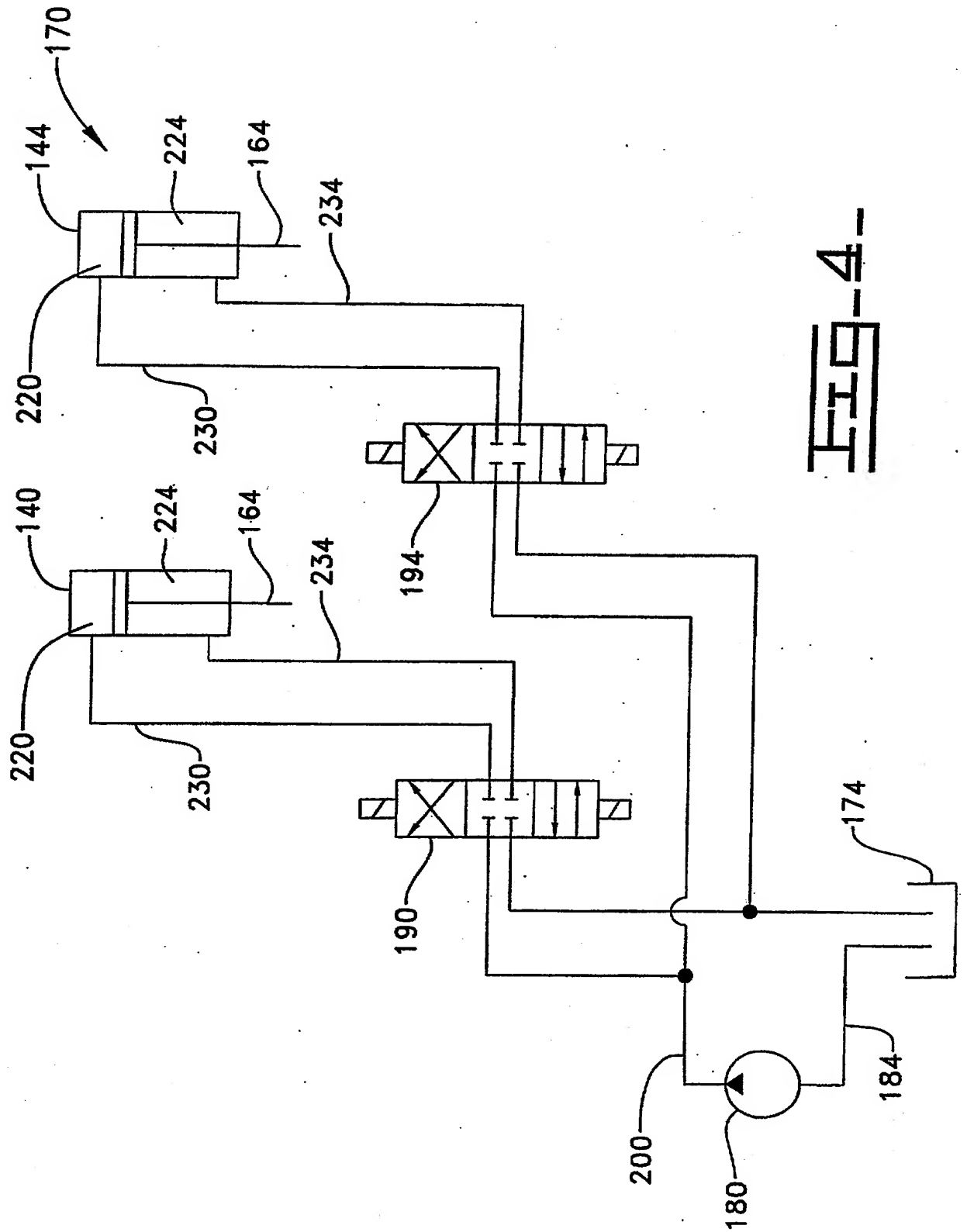


FIG. 4

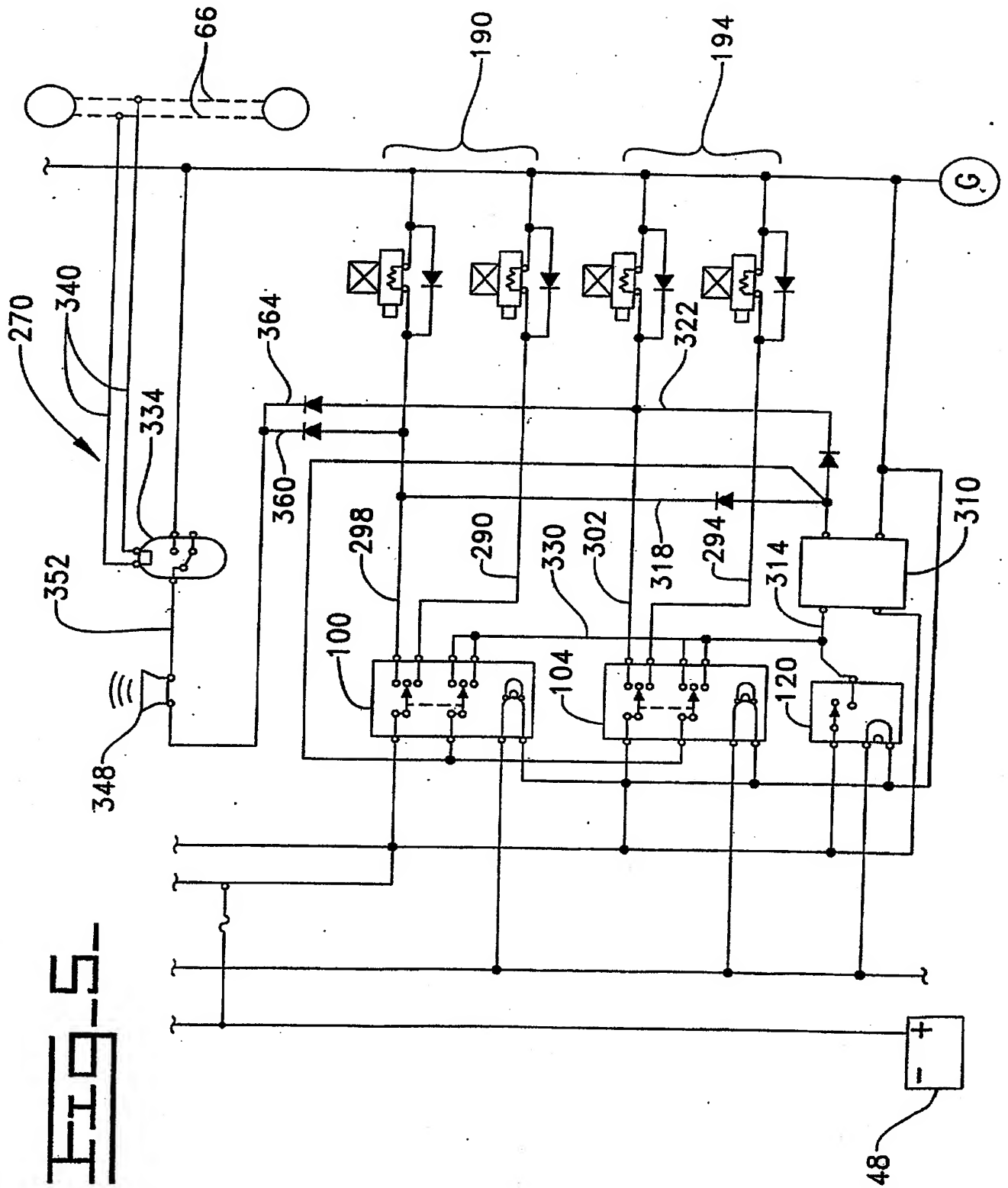


FIG-5-

1 AN AUTO-UP SWITCH FOR SIMULTANEOUSLY RETRACTING A
2 PAIR OF STABILIZER LEGS ON A BACKHOE LOADER MACHINE
3

4
5 Technical Field

6 This invention relates generally to a
7 mechanism for retracting a pair of stabilizer legs
8 for a backhoe loader machine and more particularly to
9 the ability to simultaneously retract the pair of
10 stabilizer legs with a single switch from an extended
11 position to a fully retracted position.
12

13 Background Art

14 It is well known that a machine, such as a
15 backhoe loader, is used to dig ditches, foundations,
16 basements, and the like. During such machining
17 operations, the backhoe loader machine utilizes a
18 pair of stabilizer legs to maintain a steady and
19 solid working foundation. The foundation is
20 established when the pair of stabilizer legs are
21 extended either individually or together by separate
22 and continuous activation of a pair of control
23 switches. Each one of the pair of control switches
24 is coupled with a respective one of the pair of
25 stabilizer legs and the amount of stabilizer leg
26 extension depends on the surrounding terrain.
27 Generally, upon completion of machining operations,
28 the pair of stabilizer legs are retracted through the
29 separate and continuous activation of the pair of
30 control switches. The ability to retract both of the

1 stabilizer legs simultaneously without continuous
2 operation of the pair of control switches, however,
3 would be beneficial for an operator due to an ease in
4 operation.

5 A design disclosed in U.S. Pat.
6 No.4,124,226 issued to Frank T. Phillips on 07
7 November 1978 utilizes four hydraulically operated
8 outrigger assemblies on a mobile crane. A control
9 system is provided for operating the eight cylinders
10 to extend, retract, and lower and raise the
11 outriggers through actuation of horizontal and
12 vertical stabilizer cylinders, respectively.
13 Simultaneous extension or retraction of the outrigger
14 assemblies is achieved by the continuous operation of
15 various switches in combination. Unfortunately, the
16 ability to simultaneously retract the outrigger
17 assemblies through a single switch that does not
18 require continuous operation is not disclosed. The
19 ability to simultaneously retract the outrigger
20 assemblies in such a manner would improve operator
21 flexibility by lessening the time and energy normally
22 spent on retracting the outrigger assemblies.

23 The present invention is directed to
24 overcoming the problems as set forth above.

25
26 Disclosure of the Invention

27
28 In one aspect of the present invention, a method
29 is disclosed for individually extending and
30 simultaneously retracting a pair of stabilizer legs
31 for a work machine. The work machine has a control

1 device for selecting forward or reverse directions of
2 movement for the work machine and is operatively
3 associated with a power source. The method comprises
4 the steps of activating a pair of control switches in
5 communication with the power source. One of the pair
6 of control switches is operatively associated with a
7 respective one of a pair of stabilizer legs for
8 individually moving the stabilizer legs from a
9 retracted position to an extended position. Then,
10 activating a singular auto-up switch in communication
11 with the power source. The auto-up switch is
12 operatively associated with the pair of stabilizer
13 legs for moving both of the pair of stabilizer legs
14 simultaneously from the extended position to the
15 retracted position.

16 In another aspect of the invention, a work
17 machine has front and rear end portions, a control
18 panel disposed within an interior of the work
19 machine, a pair of stabilizer legs connected to the
20 rear end portion, a hydraulic cylinder operatively
21 associated with each of the pair of stabilizer legs
22 for moving the stabilizer legs in a plurality of
23 positions between fully extended and fully retracted.
24 The work machine is capable of movement in forward or
25 reverse directions and has a control device for
26 selecting the forward or reverse direction. The
27 invention comprises
28 a pair of control switches located on the control
29 panel that are operatively associated with a
30 respective one of the pair of stabilizer legs. The
31 pair of control switches are adapted through

1 activation for actuating the hydraulic cylinders
2 individually to move the stabilizer legs from any one
3 of the plurality of retracted positions to any one of
4 the plurality of extended positions. A singular
5 auto-up switch is located on the control panel and is
6 operatively associated with the pair of stabilizer
7 legs. The auto-up switch is adapted through
8 activation for actuating the pair of hydraulic
9 cylinders simultaneously to move both of the pair of
10 stabilizer legs from the any one of the plurality of
11 extended positions to the fully retracted position.

12 The present invention includes the ability
13 to simultaneously retract a pair of stabilizer legs
14 for a work machine through a single, auto-up switch.
15 The simultaneous and automatic retraction of the pair
16 of stabilizer legs increases ease of operation and
17 operator flexibility.

18 19 Brief Description of the Drawings

20 Fig. 1 is a side elevational view of a
21 backhoe loader machine having an extension and
22 retraction system for a pair of stabilizer legs in
23 accordance with the present invention and depicting
24 the stabilizer legs in an extended position;

25 Fig. 2 is a side elevational view of the
26 backhoe loader machine of Fig. 1 depicting the
27 stabilizer legs in a fully retracted position;

28 Fig. 3 is an enlarged perspective view of a
29 portion of a control panel within the interior of a
30 cab for the backhoe loader machine of Fig. 1;

1 Fig. 4 is an enlarged hydraulic schematic
2 showing the hydraulic operation of the extension and
3 retraction system in detail and in accordance with
4 the present invention; and

5 Fig. 5 is a schematic diagram of the
6 electrohydraulic extension and retraction system for
7 the backhoe loader machine of Fig. 1 in accordance
8 with the present invention.

9
10 Best Mode for Carrying Out the Invention

11 While the invention is susceptible to
12 various modifications and alternative forms, a
13 specific embodiment thereof has been shown by way of
14 example in the drawings and will herein be described
15 in detail. It should be understood, however, that
16 there is no intent to limit the invention to the
17 particular form disclosed, but on the contrary, the
18 intention is to cover all modifications, equivalents,
19 and alternatives falling within the spirit and scope
20 of the invention as defined by the appended claims.

21 Referring to Figs. 1-5, a work machine 10,
22 such as a backhoe loader, is shown incorporating an
23 extension and retraction system 20 for a pair of
24 stabilizer legs 24,28. Although the present
25 invention is shown in operative association with a
26 backhoe loader, it should be understood that the
27 present invention may be incorporated on any suitable
28 work machine 10. Looking more closely at Figs. 1-2,
29 the backhoe loader 10 includes a machine frame 32
30 with front and rear end portions 36,40 supported for
31 travel by a plurality of wheels, one of which is

1 shown at 44. An electrical power source 48, such as a
2 battery, is disposed within the frame 32 of the
3 backhoe loader 10 and is shown schematically on Fig.
4 5. A cab 60 is mounted on the frame 32 in a well-
5 known manner and has an interior portion 64. A
6 control device 66, shown schematically in Fig. 5, is
7 disposed within the interior portion 64 to allow the
8 operator (not shown) to select either forward or
9 reverse directions of movement for the backhoe loader
10 10. It should be understood that the control device
11 66 may be of any suitable design for actuating either
12 a standard or automatic transmission of the backhoe
13 loader 10. The interior portion 64 includes a seat
14 68 therein for occupation by the operator (not
15 shown). The seat 68 swivels between front and rear
16 positions 80,84, the rear position 84 being shown in
17 Fig. 1. When the seat 68 is in the rear position 84,
18 it faces a rear control panel 88, a portion of which
19 is shown in Fig. 3. The rear control panel 88 is
20 connected in a well-known manner within the interior
21 portion 64 of the cab 60. As seen in Fig. 3, a pair
22 of control switches 100,104 of any suitable type,
23 such as spring-loaded toggle switches, capable of
24 movement to upper and lower control positions 108,112
25 are mounted on the rear control panel 88. A single,
26 auto-up switch 120 of any suitable type, such as a
27 push button spring-loaded switch, is mounted adjacent
28 one of the pair of control switches 100. It should
29 be understood that the control switches 100,104 and
30 the auto-up switch 120 may be mounted on any suitable
31 structure within the interior portion 64 of the cab

1 60. It should also be understood that the control
2 switches 100,104 or the auto-up switch 120 may be
3 incorporated together or separately to achieve the
4 same function. The control switches 100,104 and
5 auto-up switch 120 are connected for activation to
6 the electrical power source 48 in a well-known
7 manner.

8 Referring again to Figs. 1-2, the pair of
9 stabilizer legs 24,28 are secured on the rear end
10 portion 40 of the frame 32 in a conventional manner.
11 The stabilizer legs 24,28 are movable between a fully
12 extended position 130 and a fully retracted position
13 134 (the fully retracted position 134 being shown in
14 Fig. 2). It should be understood that the stabilizer
15 legs 24,28 may be positioned at any one of a
16 plurality of positions along the fully extended and
17 fully retracted positions 130,134. The movement of
18 the stabilizer legs 24,28 is accomplished through a
19 pair of hydraulic cylinders 140,144. Each of the
20 pair of hydraulic cylinders 140,144 are connected in
21 a well-known manner at a first end 150 to the frame
22 32 and at a second end 154 to a respective one of the
23 pair of stabilizer legs 24,28. The hydraulic
24 cylinders 140,144 may be of any suitable type, but
25 preferably double actuated. The double actuated
26 hydraulic cylinders 140,144 each include a housing
27 160 with a piston and rod assembly 164 therein, seen
28 more clearly in Fig. 1 and also diagrammatically in
29 hydraulic circuit 170 of Fig. 4.

30 The hydraulic circuit 170 of Fig. 4
31 includes a reservoir 174 for holding a quantity of

1 hydraulic fluid. The reservoir 174 is connected to a
2 pump 180 via line 184. The pump 180 may be of any
3 suitable type capable of pressurizing the hydraulic
4 fluid. The pump 180 is connected to a pair of
5 solenoid valves 190,194 via line 200. The solenoid
6 valves 190,194 may be of any suitable type but
7 capable of actuation from a normally closed position
8 (not shown) to either a first or second open position
9 (not shown). Each of the solenoid valves 190,194
10 includes a control valve (not shown) therein and is
11 connected to a respective one of the pair of
12 hydraulic cylinders 140,144. The piston and rod
13 assembly 164, normally disposed at a mid-position, is
14 capable of moving the stabilizer legs 24,28 between
15 the extended and retracted positions 130,134
16 dependent upon the introduction of pressurized
17 hydraulic fluid into either upper or lower portions
18 220,224 of the hydraulic cylinders 140,144 through
19 lines 230,234, respectively, in response to movement
20 of the control valves (not shown) to either of the
21 first or second open positions (not shown) in a well-
22 known manner. It should be understood that although
23 the solenoid valves 190,194 shown have two open
24 positions respectively connected to the upper and
25 lower portions 220,224 of the hydraulic cylinders
26 140,144 to facilitate the extension and retraction of
27 the stabilizer legs 24,28, two separate solenoid
28 valves could be utilized to achieve the same
29 function. Referring more particularly to an
30 electrical circuit 270 for the extension and
31 retraction system 20, shown in Fig. 5, the pair of

1 control switches 100,104 and auto-up switch 120 are
2 shown schematically in communication with the
3 electrical power source 48. Each of the control
4 switches 100,104 are coupled to a respective solenoid
5 valve 190,194 via extension and retraction lines
6 290,294,298,302, respectively. It should be
7 understood that four solenoid valves are shown in
8 Fig. 5 to clarify the separate extension and
9 retraction circuits of each of the stabilizer legs
10 24,28. A timer relay 310 is shown coupled via input
11 line 314 to the auto-up switch 120 and coupled via
12 output lines 318,322 to each of the control switches
13 100,104, respectively. Further, the control switches
14 100,104 are coupled to the timer relay 310 through
15 input line 330 which is operative with input line 314
16 from the auto-up switch 120. The control device 66
17 is connected to an alarm relay 334 through output
18 lines 340. The alarm relay 334 is coupled to an
19 alarm device 348 via line 352. The pair of control
20 switches 100,104 are coupled to the alarm device 348
21 via output lines 360,364, respectively. It should be
22 understood that the electrical circuit 270 is
23 connected in a conventional manner to a ground G.
24 Further, lighting for the rear control panel 88 is
25 shown schematically in Fig. 5 but not described in
26 detail. It should also be understood that although a
27 timer relay 310 is described, any suitable time delay
28 mechanism, such a pressure or limit switch (not
29 shown), may be utilized without extending beyond the
30 scope of the present invention.

31

1 Industrial Applicability

2 Prior to operation of the backhoe loader 10
3 for digging, trenching, and the like, the operator
4 (not shown) will generally stabilize the backhoe
5 loader 10 by extending the stabilizer legs 24,28 into
6 contact with the surrounding terrain. To accomplish
7 that purpose, the operator (not shown) will manually
8 hold the control switches 100,104, either singularly
9 or together, in the lower control position 112 until
10 the desired extension is obtained. The movement of
11 the control switches 100,104 to the lower control
12 position 112 activates the control switches 100,104
13 to actuate the solenoid valves 190,194 to the first
14 open position in a conventional manner. The first
15 open position of the solenoid valves 190,194 allows
16 hydraulic fluid from the reservoir 174 to move
17 through the pump 180. The pump 180 pressurizes the
18 hydraulic fluid for entry through the solenoid valves
19 190,194 and into the upper portion 220 of the
20 hydraulic cylinders 140,144, thus extending the
21 stabilizer legs 24,28. The retraction of the
22 stabilizer legs 24,28 may also be accomplished
23 through the control switches 100,104. To accomplish
24 that purpose, the operator (not shown) will manually
25 hold the control switches 100,104, either singularly
26 or together, in the upper control position 108 until
27 the desired retraction is obtained. As described
28 previously, the movement of the control switches
29 100,104 to the upper control position 108 activates
30 the control switches 100,104 to actuate the solenoid
31 valves 190,194 to the second open position.

1 Conversely, pressurized hydraulic fluid flows through
2 the solenoid valves 190,194 and into the lower
3 portion 224 of the hydraulic cylinders 140,144 for
4 retracting the stabilizer legs 24,28.

5 Automatic and simultaneous retraction of
6 the stabilizer legs 24,28 is beneficial for the
7 operator (not shown) when operation of the backhoe
8 loader 10 is complete. Instead of retracting the
9 stabilizer legs 24,28 manually by holding the control
10 switches 100,104 in the upper control position 108,
11 the operator (not shown) may simply push the auto-up
12 switch 120 with a single, "one-touch" contact to
13 initialize activation. The "one-touch" contact of the
14 auto-up switch 120 removes the requirement of
15 manually holding a switch continuously throughout the
16 retraction of the stabilizer legs 24,28. Once the
17 auto-up switch 120 has been activated, the timer
18 relay 310 is enabled. Thereafter, the timer relay
19 310 acts independently of the auto-up switch 120 to
20 control the simultaneous retraction of the stabilizer
21 legs 24,28 without any further contact to the auto-up
22 switch 120. This is accomplished when the timer
23 relay 310 is enabled by a primary signal from the
24 auto-up switch 120. The timer relay 310 then sends a
25 signal to activate the control switches 100,104 for a
26 preselected time, preferably greater than the total
27 time necessary to fully retract the stabilizer legs
28 24,28 from the fully extended position 130. The
29 activation of the control switches 100,104 actuates
30 the solenoid valves 190,194 into the second open
31 position, allowing pressurized hydraulic fluid to

1 flow simultaneously into the lower portions 224 of
2 the hydraulic cylinders 140,144. The stabilizer legs
3 24,28 are moved completely to the fully retracted
4 position 134 from any one of the plurality of
5 extended positions within the preselected time.
6 However, if either the control switches 100,104 or
7 auto-up switch 120 is contacted by the operator (not
8 shown) during the preselected time, the simultaneous
9 retraction of the stabilizer legs 24,28 is
10 interrupted. This occurs due to a secondary signal
11 being sent from the control switches 100,104 or auto-
12 up switch 120 during the preselected time that
13 disables the timer relay 310. Further, if the
14 operator (not shown) moves the control device 66 into
15 gear during the preselected time, thus selecting the
16 forward or reverse direction of movement for the
17 backhoe loader 10, the alarm device 348 will sound.
18 This occurs when the alarm device 348 is activated by
19 a signal from both the control device 66, when
20 selecting the forward or reverse direction of
21 movement of the backhoe loader 10, and the timer
22 relay 310, when enabled to control the simultaneous
23 retraction of the stabilizer legs 24,28. It should
24 be understood that the movement of the control device
25 66 into gear during retraction of the stabilizer legs
26 24,28, either by use of the control switches 100,104
27 or the auto-up switch 120, will cause activation of
28 the alarm device 348.

29 Other aspects, objects and advantages of
30 this invention can be obtained from a study of the
31 drawings, disclosure and the appended claims.

Claims

1

2

3

4

5

6

7

8

9

10

11

12

13

14

15

16

17

18

19

20

21

22

23

24

25

26

27

28

29

30

1. The method of individually extending and simultaneously retracting a pair of stabilizer legs for a work machine, the work machine having a control device for selecting forward or reverse directions of movement for the work machine and being operatively associated with a power source, comprising the steps of:

activating a pair of control switches in communication with the power source, one of the pair of control switches being operatively associated with a respective one of a pair of stabilizer legs for individually moving the stabilizer legs from a retracted position to an extended position; and

activating a singular auto-up switch in communication with the power source, the auto-up switch being operatively associated with the pair of stabilizer legs for moving both of the pair of stabilizer legs simultaneously from the extended position to the retracted position.

2. The method of individually extending and simultaneously retracting the pair of stabilizer legs as claimed in claim 1, wherein the step of activating the auto-up switch includes the step of:

contacting the auto-up switch in a single, non-continuous motion, the movement of both of the pair of stabilizer legs simultaneously from the extended position to the retracted position being

1 independent of further contact with the auto-up
2 switch after activation.

3
4 3. The method of individually extending
5 and simultaneously retracting the pair of stabilizer
6 legs as claimed in Claim 1, including the step of:

7 activating the auto-up switch through a
8 single, non-continuous contact that automatically
9 moves both of the pair of stabilizer legs
10 simultaneously from the extended position to the
11 retracted position, the movement of both of the pair
12 of stabilizer legs being independent of the auto-up
13 switch after the contact.

14
15 4. The method of individually extending
16 and simultaneously retracting the pair of stabilizer
17 legs as claimed in claim 2 or claim 3, including the
18 step of:

19 coupling a time delay mechanism with the
20 auto-up switch so that the simultaneous retraction of
21 the pair of stabilizer legs is completed within a
22 preselected time.

23
24 5. The method of individually extending
25 and simultaneously retracting the pair of stabilizer
26 legs as claimed in claim 4, wherein:

27 activating either of the pair of control
28 switches or the auto-up switch during the preselected
29 time disables the time delay mechanism and interrupts
30 the simultaneous retraction of the pair of stabilizer
31 legs.

1
2 6. The method of individually extending
3 and simultaneously retracting the pair of stabilizer
4 legs as claimed in claim 4 or claim 5, wherein:

5 selecting the forward or reverse direction
6 of the work machine with the control device prior to
7 the completion of the preselected time for
8 simultaneously retracting the pair of stabilizer legs
9 activates an alarm device coupled with the control
10 device and time delay mechanism.

11
12 7. The method of individually extending
13 and simultaneously retracting the pair of stabilizer
14 legs as claimed in any preceding Claim, wherein
15 moving the stabilizer legs from the retracted
16 position to the extended position includes the steps
17 of:

18 actuating a pair of solenoid valves, one of
19 the pair of solenoid valves being connected with a
20 respective one of the pair of control switches and
21 movable from a closed position to an open position by
22 the activation of the control switches; and

23 allowing a flow of pressurized hydraulic
24 fluid to move from a pump to a first end of a pair of
25 hydraulic cylinders through the actuation of the pair
26 of solenoid valves to the open position, one of the
27 hydraulic cylinders operative with a respective one
28 of the pair of stabilizer legs to move the stabilizer
29 legs from a retracted position to an extended
30 position.

31

1 8. The method of individually extending
2 and simultaneously retracting the pair of stabilizer
3 legs as claimed in claim 7, wherein moving the
4 stabilizer legs from the extended position to the
5 retracted position includes the steps of:

6 actuating the pair of solenoid valves, the
7 pair of solenoid valves being connected with the
8 auto-up switch and movable from the closed position
9 to the open position by the activation of the auto-up
10 switch; and

11 allowing the pressurized hydraulic fluid to
12 move from the pump to a second end of the pair of
13 hydraulic cylinders through the actuation of the pair
14 of solenoid valves to the open position to move the
15 stabilizer legs from an extended position to a
16 retracted position.

17
18 9. A work machine having front and rear
19 end portions, a control panel disposed within an
20 interior of the work machine, a pair of stabilizer
21 legs connected to the rear end portion, a hydraulic
22 cylinder operatively associated with each of the pair
23 of stabilizer legs for moving the stabilizer legs in
24 a plurality of positions between fully extended and
25 fully retracted, the work machine capable of movement
26 in forward or reverse directions and having a control
27 device for selecting the forward or reverse direction
28 thereof, comprising:

29 a pair of control switches located on the
30 control panel and being operatively associated with a
31 respective one of the pair of stabilizer legs and

1 adapted through activation for actuating the
2 hydraulic cylinders individually to move the
3 stabilizer legs from any one of the plurality of
4 retracted positions to any one of the plurality of
5 extended positions; and

6 a singular auto-up switch located on the
7 control panel and being operatively associated with
8 the pair of stabilizer legs and adapted through
9 activation for actuating the pair of hydraulic
10 cylinders simultaneously to move both of the pair of
11 stabilizer legs from the any one of the plurality of
12 extended positions to the fully retracted position.
13

14 10. The work machine as claimed in claim
15 9, wherein the auto-up switch actuates the pair of
16 hydraulic cylinders automatically when activated by a
17 single, non-continuous contact, the movement of both
18 of the pair of stabilizer legs being independent of
19 further contact with the auto-up switch after
20 activation.
21

22 11. The work machine as claimed in claim
23 10, including a time delay mechanism in communication
24 with the auto-up switch, the time delay mechanism
25 being responsive to the auto-up switch for
26 controlling the completion of the simultaneous
27 retraction of the pair of stabilizer legs within a
28 preselected time.
29

30 12. The work machine as claimed in claim
31 11, wherein during the preselected time and in

1 response to either of the pair of control switches or
2 the auto-up switch the time delay mechanism
3 interrupts the simultaneous retraction of the pair of
4 stabilizer legs.

5

6 13. The work machine as claimed in any one
7 of claims 9 to 12, wherein the auto-up switch is
8 located separately from the pair of control switches.

9

10 14. The work machine as claimed in any one
11 of claims 9 to 12, wherein the auto-up switch is
12 integral with the pair of control switches.

13

14 15. The work machine as claimed in any one
15 of claims 9 to 14, wherein actuation of the hydraulic
16 cylinders for individually moving the stabilizer legs
17 from the any one of the plurality of retracted
18 positions to the any one of a plurality of extended
19 positions is controlled through a hydraulic circuit
20 including a pair of solenoid valves movable between
21 open and closed positions and a pump in fluid
22 communication with the pair of solenoid valves, each
23 of the solenoid valves being connected to a
24 respective one of the pair of control switches and
25 adapted for actuation to the open position when
26 either of the pair of control switches is activated.

27

28 16. The work machine as claimed in any of
29 claims 9 to 15, wherein the actuation of the
30 hydraulic cylinders for simultaneously moving the
31 stabilizer legs from the any one of the plurality of

1 extended positions to the fully retracted position is
2 controlled through a hydraulic circuit including a
3 pair of solenoid valves movable between open and
4 closed positions and a pump in fluid communication
5 with the pair of solenoid valves, both of the
6 solenoid valves being connected to the auto-up switch
7 and adapted for actuation to the open position when
8 the auto-up switch is activated.

9
10 17. The work machine as claimed in claim
11 16 when dependent on claim 11 or claim 12, wherein
12 both of the solenoid valves are further connected to
13 the time delay mechanism.

14
15 18. A method of individually extending and
16 simultaneously retracting a pair of stabilizer legs
17 for a work machine, substantially as hereinbefore
18 described with reference to the accompanying
19 drawings.

20
21 19. A work machine substantially as
22 hereinbefore described with reference to the
23 accompanying drawings.

24



INVESTOR IN PEOPLE

Application No: GB 0011756.4
Claims searched: 1-19

Examiner: Dave McMunn
Date of search: 19 October 2000

Patents Act 1977 Search Report under Section 17

Databases searched:

UK Patent Office collections, including GB, EP, WO & US patent specifications, in:

UK Cl (Ed.R): B8H (HAC, HFC).

Int Cl (Ed.7): E02F 9/08.

Other: ONLINE : WPI, EPODOC, JAPIO.

Documents considered to be relevant:

Category	Identity of document and relevant passage	Relevant to claims
A	EP 0,741,209 A2 (CLARK). See Figs 3 & 4 & note lines 18-24 column 6	1, 9
A	EP 0,285,281 A1 (CASE). Note stabiliser safety arrangement	1,9
A	US 4,515,520 (CASE). Note stabiliser control circuits shown in Fig 7 onwards	1,9

X	Document indicating lack of novelty or inventive step	A	Document indicating technological background and/or state of the art.
Y	Document indicating lack of inventive step if combined with one or more other documents of same category.	P	Document published on or after the declared priority date but before the filing date of this invention.
&	Member of the same patent family	B	Patent document published on or after, but with priority date earlier than, the filing date of this application.